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**STORM DRAIN REPORT**

**FOR**

**KELLY AVE.**

**RAMONA, CALIFORNIA**

**Prepared on:**  
**January 30, 2007**

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**DEPARTMENT OF PLANNING  
AND LAND USE**

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**PROJECT DESCRIPTION:**

This storm drain report has been prepared as part of the grading permit submittal requirements for the development of the Kelly Avenue project. The project is the construction of two multifamily residential pads on approximately 0.82 acres. The project lies east of Highway 67 and between Pala Street and Letton Street See Figure 1, Vicinity Map. See Figures 2A and 2B Existing and Proposed Hydrology Map attached at the end of this report for the drainage basin limits.

**METHODOLOGY:**

This drainage report has been prepared in accordance with current County of San Diego regulations and procedures. All of the proposed trapezoidal channels were designed to intercept and convey the 100-year storm as well as cleanse the runoff generated by the 85<sup>th</sup> percentile storm. The Modified Rational Method was used to compute the anticipated runoff. The following references have been used in preparation of this report:

- (1) County of San Diego Hydrology Manual, June 2003.
- (2) Handbook of Hydraulics, E.F. Brater & H.W. King, 6<sup>th</sup> Ed., 1976.
- (3) Open Channel Hydraulics, V.T. Chow, 1959.

**EXISTING CONDITIONS:**

The existing project site consists of an undeveloped dirt site that takes up approximately 0.82 acres. Approximately 1/6 of the site consists of landscaping areas yet approximately 3/5 of the site is considered pervious surface considering the use of pavers in all drivable areas.

**DEVELOPED CONDITIONS:**

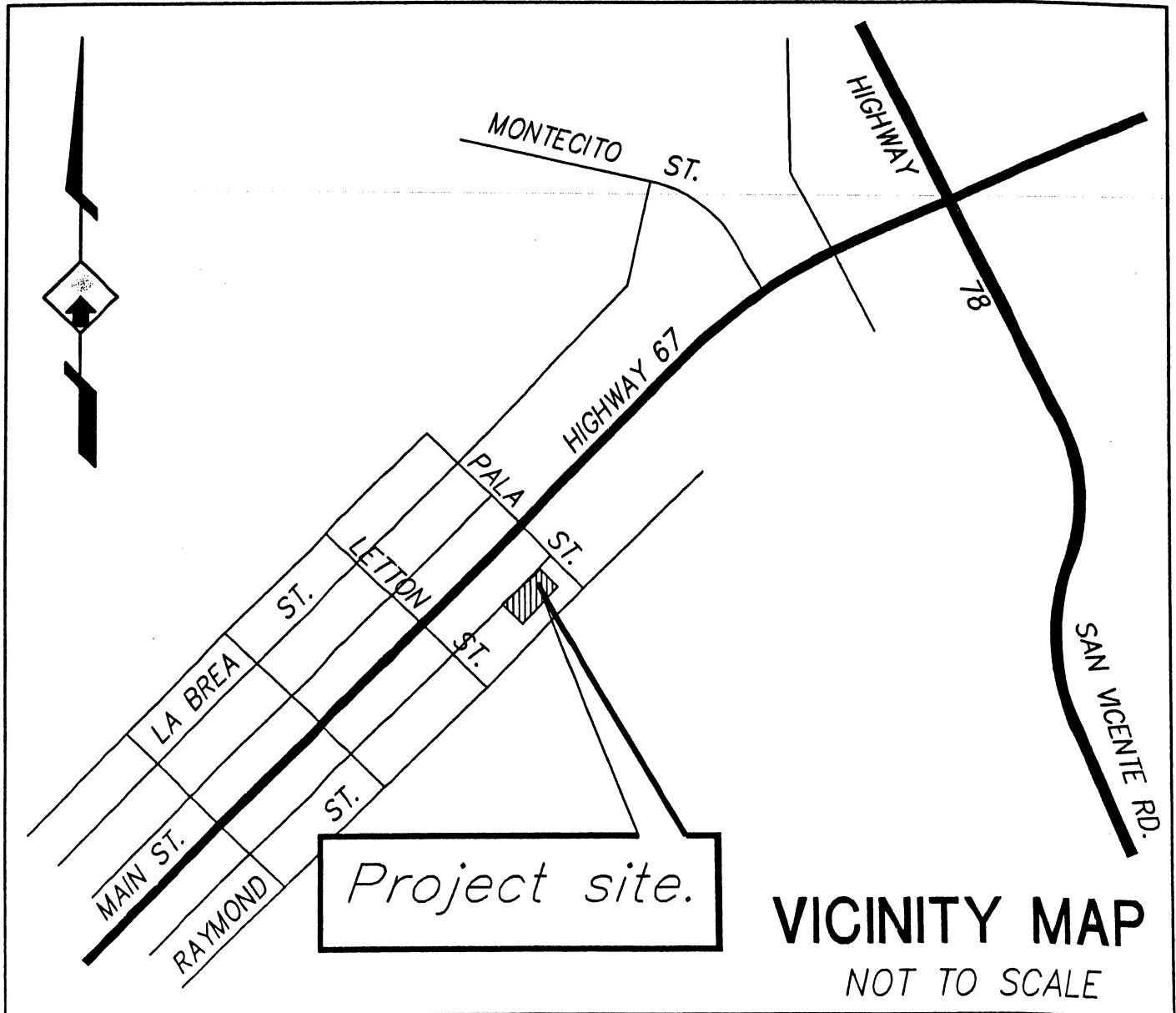
The project is the construction of two multifamily residential pads on approximately 0.82 acres. Six parking spaces are to be added to the site.

**EXISTING RUNOFF ANALYSIS:**

The surface runoff for the existing 0.82 acre lot follows natural drainage paths and includes offsite run-on from adjacent properties. A runoff coefficient of 0.41 would be appropriate for the existing natural basin due to the offsite developments that run onto the site. See appendix A-1 for runoff coefficient calculations.

**DEVELOPED RUNOFF ANALYSIS:**

The runoff coefficients for the site were based on soil group D and the ultimate improvements for the proposed site. A coefficient of 0.69 would be appropriate for basin A-2. A coefficient of 0.70 would be appropriate for basin A-4. A coefficient of 0.63 will be used for Basin B-2. Basins A-1, A-3, and B-1 are all undisturbed from their current state, thus we will use the coefficient of 0.41, the same coefficient use to determine their existing flow. Based off the method described in the appendix A-1.



## **TRAPEZOIDAL CHANNEL DESIGN AND ANALYSIS**

The trapezoidal channel within this project was sized using King's Handbook (Ref. 3) Table 7-11. For trapezoidal channels:

$$K' = Qn/[b^{(8/3)s^{(1/2)}]} \text{ where}$$

**K'** = Discharge Factor

**Q** = Runoff Discharge (cfs)

**n** = Manning's Coefficient

**b** = Channel Bottom Width (ft)

**s** = Channel Slope (ft/ft)

The Natural, vegetated lined trapezoidal channels are capable of withstanding erosion for velocities up to 5 fps. The flows have been calculated and the rates of flow do not exceed 5 fps.

### **100YEAR STORM INNUNDATION:**

The design of this site requires that the pad be elevated above the grade of the centerline by taking into account the inundation from the underdeveloped storm water conveyance system in the area. The area has a Q100 of 166 cfs that flows down Kelly Ave per the Detailed Drainage Study for a Portion of The Ramona Area, San Diego County prepared by Howard H. Chang Consultants. The inundation was calculated based on the confinement of this water strictly to the developed roadway area and parkway areas. Upon development of Kelly Avenue on both sides of the street the Right of Way will be able to convey 83 cfs. That is one half of the required amount. By adding protective berming in behind the right of way to a minimum height of 0.23' above the centerline elevation the necessary storm water can be conveyed beyond this property frontage with the risk of flooding. The finish floor is set at a height of 0.72' above the centerline elevation. See the attached calculations for clarification.

### **RESULTS AND CONCLUSIONS:**

The existing condition for the 100-year storm generates 2.3 cfs of runoff for Basin 'EX-1' based upon a Time of Concentration for Urban Overland of 18.8 minutes. The developed condition for the 100-year storm generates 3.0 cfs of runoff from Basin A. The developed condition for the 100-year storm generates 0.8 cfs is from Basin B. The total developed runoff flow for the 100 year condition will be 3.8 cfs based on a weighted 'C' value and times of concentration of 16.9 and 29.0 minutes respectively. All of the proposed trapezoidal channels were designed to intercept and convey the 100-year storm as well as cleanse the runoff generated by the 85<sup>th</sup> percentile storm.

The site proposes an on-site detention facility to alleviate the increase storm water runoff of 1.5 cfs. The proposed detention facility will consist of vegetated swales that run along the frontage of the buildings and in between the buildings. They will provide 1020 cf of storage volume when full to capacity. In order to mitigate for the increase in flow the amount of storage volume required is 921 cf. The orifices allowing the water to exit the detention facility have been sized to allow the detention basin to reach its required

volume without exceeding the detention basin design height. The orifices shall be one 6" pipe and one 4" pipe connecting to a standard curb outlet.

The post developed flow must match that of the pre-developed conditions in order to determine that the development of this site will have zero adverse effects to the downstream properties. Thus, through on-site storm water detention the amount of water to leave the developed site will be equal to or less than the pre-developed condition.

It is the opinion of Partners planning and Engineering that the downstream system currently fails and property damage to downstream properties may or may not occur during storm events. The proposed project has detained the developed flows to the pre-developed flows and as such the project will not have adverse effect on the downstream properties. See the attached calculations for clarification.

Outfall	Tributary Area (acres)	$Q_{100}$ (cfs)	$Q_{WQ}$ (cfs)
Pre	1.49	2.3	0.12
Post	1.49	3.8	0.16
Post w/ detention	1.49	2.3	0.16

## ***APPENDIX***

Basin	Impervious Area w/o pavers	Impervious Area w/ pavers	Total Area	Impervious % w/o pavers	Impervious % w/ pavers	C-Value w/o pavers	C-Value w/ pavers
A-1	0.00	0.00	0.07	0.00	0.00	0.41	0.41
A-2	0.19	0.09	0.23	82.61	36.96	0.84	0.69
A-3	0.00	0.00	0.30	0.00	0.00	0.41	0.41
A-4	0.35	0.19	0.47	74.47	40.43	0.82	0.70
B-1	0.00	0.00	0.31	0.00	0.00	0.41	0.41
B-2	0.095	0.02	0.11	86.36	18.2	0.86	0.63

**Note:** The Cp-value= 0.57 was determined from table 3-1 of the San Diego County Hydrology Manual based off the 39.0% impervious site with the use of pavers (impervious surface). All undisturbed areas were set to match the pre-existing conditions and the C-values for the developed conditions were calculated based on San Diego Hydraulics Manual section 3-1.2.

## HYDROLOGY SUMMARY

Travel Time in Grass Swale												Remarks									
Basin No.	Area (ac)	C (ft/ft)	L (ft)	S <sub>o</sub> (in/hr)	T <sub>i</sub> (min)	I <sub>i</sub> (cfs)	Q <sub>i</sub> (ft/sec)	s (%)	n	b (ft)	K' (ft)	D/b (ft/ft)	D (ft)	A <sub>r</sub> (sf)	V (ft/sec)	L (ft)	T <sub>t</sub> (min)	T <sub>c</sub> (min)	I (in/hr)	85th Percentile P6 = 0.2 Inches	
Existing																					
EX-1	1.49	0.41	315	1.60	18.8	0.20	0.12														
Proposed																					
A1	0.07	0.41	150	1.20	14.3	0.20	0.01														
A2	0.23	0.69	225	0.55	13.5	0.20	0.03														
CP1					13.51		0.04	0.01	0.25		7.00	7E-04	0.01	0.07	0.49	0.08	90	19.81	33.32	2.64	
A3	0.30	0.41	150	1.50	13.3	0.20	0.02														
A4	0.47	0.70	265	0.83	12.5	0.20	0.07														
CP2					12.47		0.09	0.01	0.25		7.00	0.002	0.02	0.14	1.00	0.09	90	16.59	29.06	2.88	
CP3					29.06		0.12														
B1	0.31	0.41	225	1.00	18.6	0.20	0.03														
B2	0.11	0.63	150	1.00	10.4	0.20	0.01														
CP4					29.0		0.20	0.04													
									Total Q (cfs)	0.16											

HYDROLOGY SUMMARY										Travel Time in Grass Swale						Remarks			
Basin No.	Area (ac)	C (ft)	L (ft)	S <sub>o</sub> (ft/ft)	T <sub>i</sub> (min)	Q (cfs)	s (in/hr)	n (%)	b (ft/ft)	K' (ft)	D/b (ft/ft)	D (ft)	Area (sf)	V (ft/sec)	L (ft)	T <sub>t</sub> (min)	T <sub>c</sub> (min)	I (in/hr)	
Existing																			
EX-1	1.49	0.41	315	1.60	18.8	3.81	2.3												
Proposed																			
A1	0.07	0.41	150	1.20	14.3	4.55	0.1												
A2	0.23	0.69	225	0.55	13.5	4.72	0.7												
CP1					13.51	4.72	0.9	0.005	0.25	7.00	0.02	0.07	0.49	3.67	0.24	90	6.26	19.77	3.69
A3	0.30	0.41	150	1.50	13.3	4.77	0.6												
A4	0.47	0.70	265	0.83	12.5	4.97	1.6												
CP2					12.47	4.97	2.2	0.005	0.25	7.00	0.04	0.12	0.84	6.59	0.34	90	4.45	16.92	4.08
CP3						16.92	4.08	3.0											
B1	0.31	0.41	225	1.00	18.6	3.83	0.5												
B2	0.11	0.63	150	1.00	10.4	5.60	0.4												
CP4						29.0	2.88	0.9											
						Total Q (cfs)	3.8												

NOTE:

Since the hundred year event discharge rate exceeds the existing condition the site will need to detain 1.5 cfs to match the predeveloped flow of 2.3 cfs.  
(see the attached detention calculations for clarification)

NOTE:

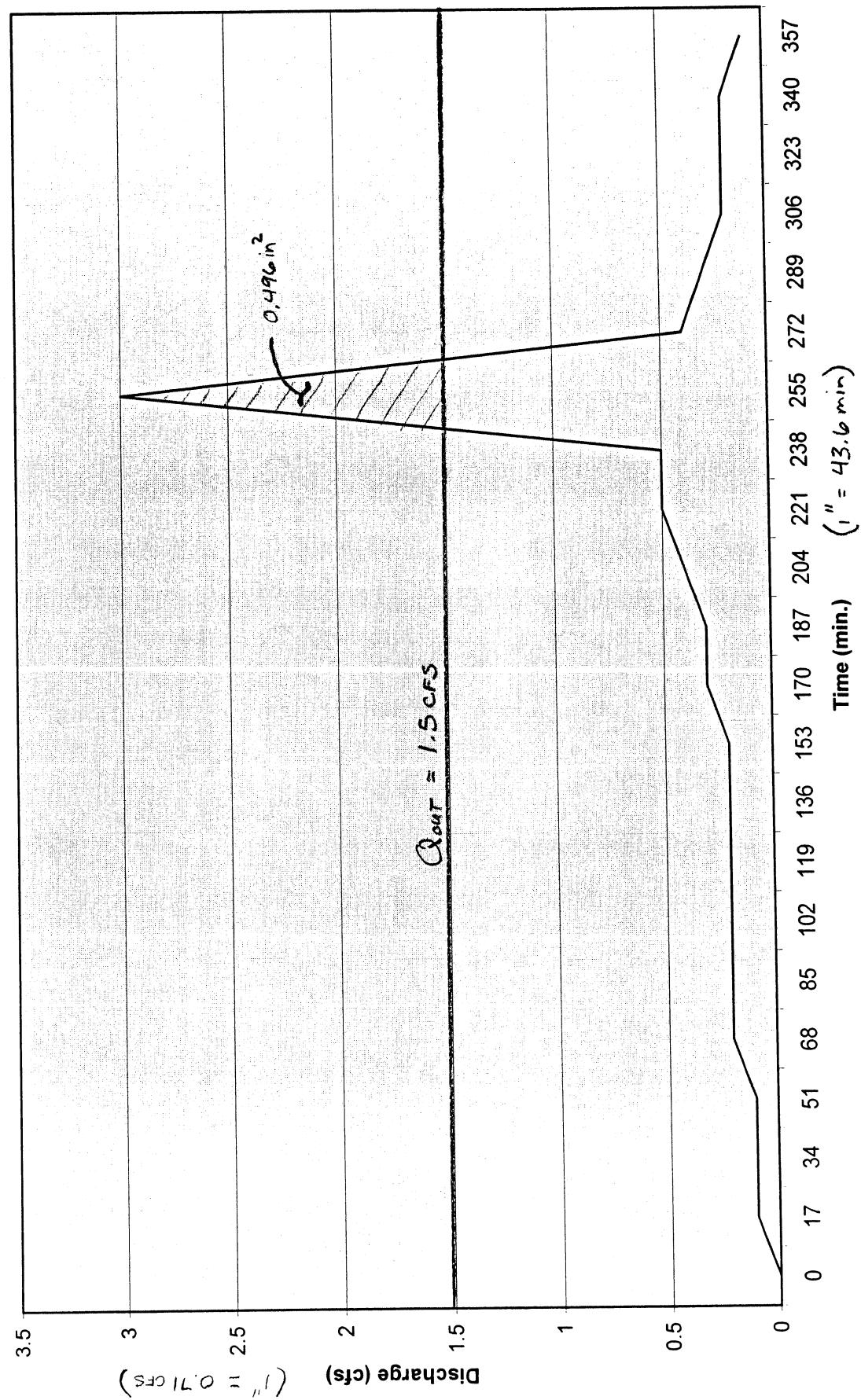
Grass swale velocity cannot exceed over 5.0 fps.

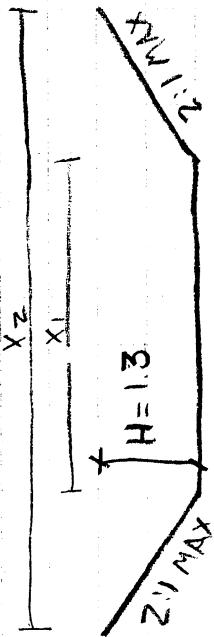
The grass swales are designed to have a velocity of no more than 0.75 fps.

**Detention Calcs.**

Time (min)	discharge (cfs)
0	0
17	0.1
34	0.1
51	0.1
68	0.2
85	0.2
102	0.2
119	0.2
136	0.2
153	0.2
170	0.3
187	0.3
204	0.4
221	0.5
238	0.5
255	3
272	0.4
289	0.3
306	0.2
323	0.2
340	0.2
357	0.1
374	0

### Discharge Rates





$$x_1 = 7'$$

$$x_2 = 12.2'$$

180'

$$Vol = \left[ \frac{(x_1 + x_2)H}{2} + \frac{(x_2 - x_1)(H)u}{6} \right]$$

$$Vol_A = 970 \text{ cf}$$

$$Vol_B = 200 \text{ cf}$$

### VOLUME CALCS

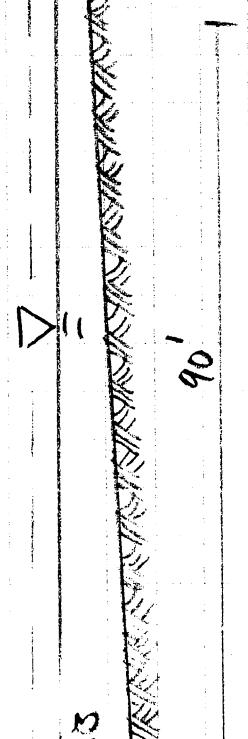
A)



B)

$$H_2 = 0.4'$$

- VOLUME IN FRONT OF BUILDINGS



C)

$$H = 90'$$

- VOLUME BETWEEN BUILDINGS
- VOLUME IN FRONT OF BUILDINGS

$$Vol_C = 150 \text{ cf}$$

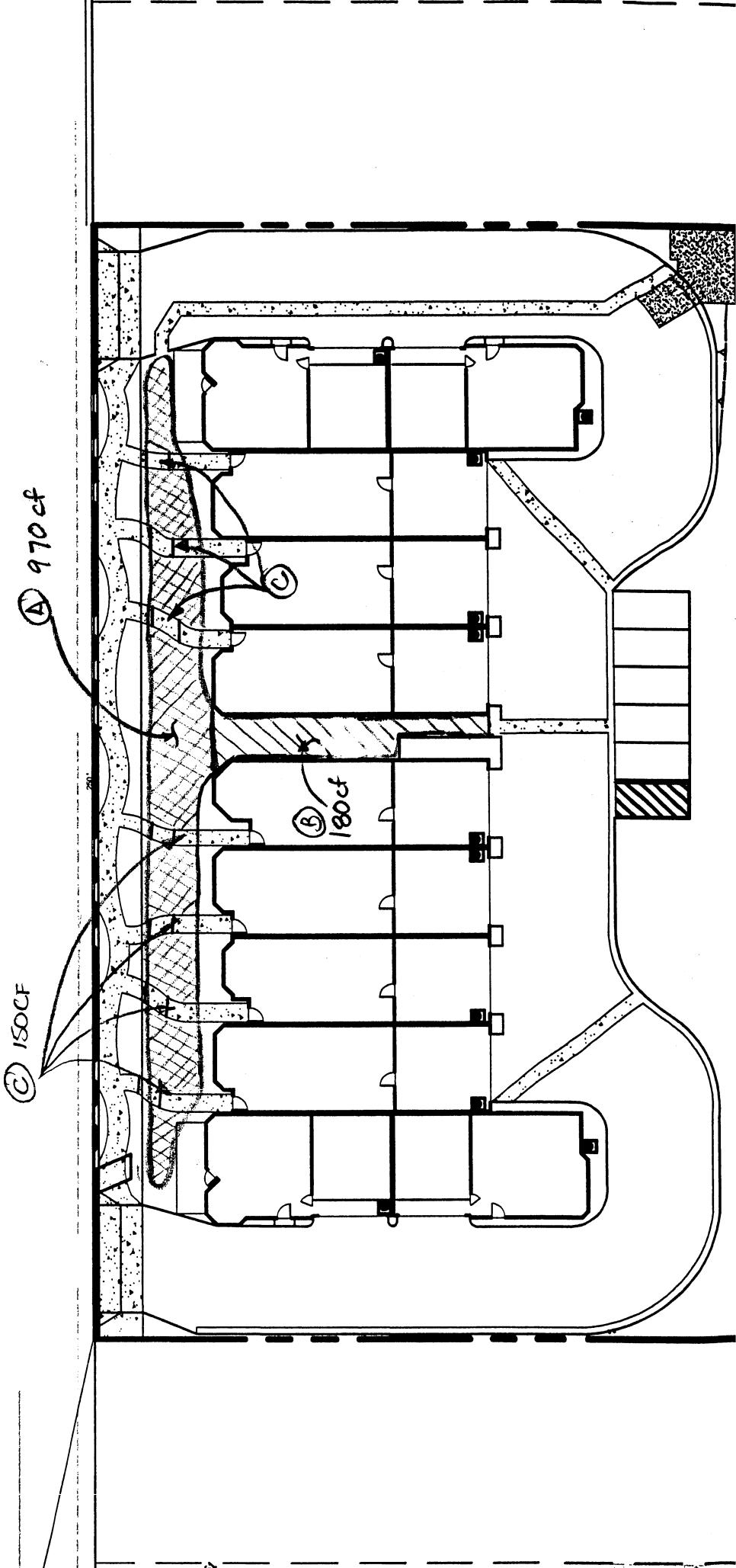
- VOLUME IN FRONT LOST DUE TO SIDE WALKS w/ UNDERDRAINS

$$Vol_{(Available)} = (Vol_A + Vol_B) - Vol_C = 970 + 200 - 150 = 1,020 \text{ cf}$$

$$Vol_{(Available)} = 1,020 \text{ cf}$$

NOTE: VOLUME LOST DUE TO WALKWAYS ARE DENOTE  $\textcircled{C}$  SEE ATTACHED  
CALC SHEET FOR VOLUME CALCS.

KELLY AVENUE



Sunrise Villas, Ramona California  
Hydraulic Analysis of detention basin outlet structures

DETENTION BASIN A (aboveground detention 180' grass swale)

**ORIFICE EQUATION**

Weir Formula for Orifices and Short Tubes (free & submerged)

$$Q = Ca(2gh)^{1/2}$$

where

$Q$  = the flow rate, ft<sup>3</sup>/sec

$C$  = the orifice coefficient of discharge

$a$  = the open area of the orifice

$g$  = the acceleration due to gravity

$h$  = head on the horizontal centerline of the orifice

$$Q = Ca(2*32.2)h^{1/2}$$

$$Q = Ca(64.4h)^{1/2}; C = 0.6$$

$$Q = 4.812a(h)^{1/2}$$

or

$$h = [Q/(4.812a)]^2$$

Detention Basin Calc

Given:

$$Q = 1.5 \text{ cfs}$$

$$Y_{min} = 1.19 \text{ ft.}$$

$$Y_{max} = 1.30 \text{ ft}$$

Where,  $Y_{max}$  is the height of the water (to flow line of 'F' catch basin, worse case scenario) and  $Y_{min}$  is the height of the water (to achieve necessary detention volume)

Smallest usable area:

$$a = [Q/(4.812h^{1/2})]$$

$$a_{min} = 0.273 \text{ ft}^2$$

$$a_{max} = 0.286 \text{ ft}^2$$

Assume:

$$a = 0.349 \text{ sq. ft for a 8" diameter pipe}$$

$$a = 0.196 \text{ sq. ft for a 6" diameter pipe}$$

$$a = 0.087 \text{ sq. ft for a 4" diameter pipe}$$

$$a = 0.283 \text{ sq. ft for 1-6" and 1-4" diameter pipe}$$

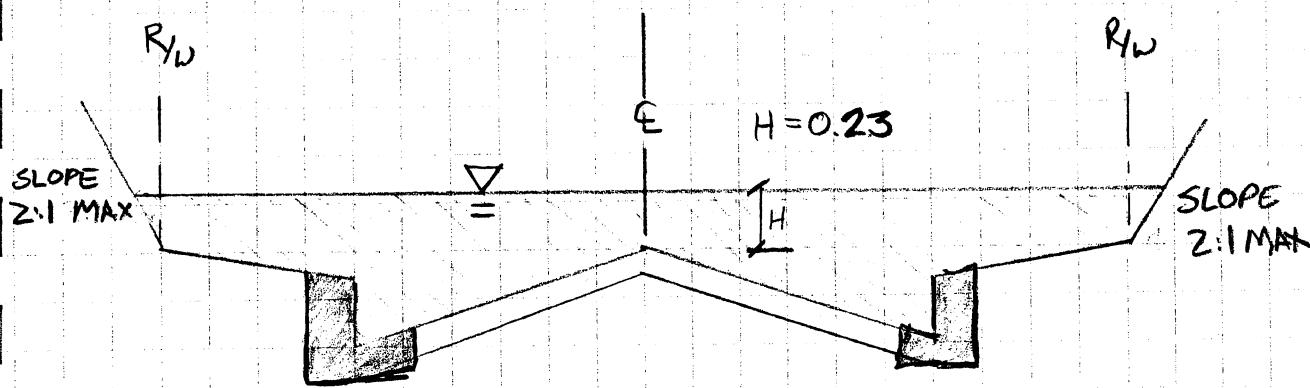
Then:

We will use one 4" diameter pipe and one 6" diameter pipe at the outlet to the face of curb.

Check:

Is  $Y_{min} = 1.19 \text{ ft} < (h = 1.21 \text{ ft}) < Y_{max} = 1.3 \text{ ft}$  Yes

100 year flood INUNDATION CALCS.



$$m = 0.62\% - 0.0062$$

$$n = 0.013$$

$$H = 0.23$$

$$\text{AREA} = 32.68 \text{ sq ft}$$

$$\text{Perimeter} = 73.72 \text{ ft}$$

$$V = \frac{Q}{A}$$

$$Q = \left(\frac{1.486}{n}\right) \times \left(\frac{A}{P}\right)^{2/3} \times (m)^{1/2} \cdot (A)$$

$$Q = \frac{1.486}{0.013} \times \left(\frac{32.68}{73.72}\right)^{2/3} \times (0.0062)^{1/2} \cdot (32.68)$$

$$Q = 171.0 \text{ cfs}$$

$$V = \left(\frac{171.0}{32.68}\right) = 5.23 \text{ fps}$$

<b>100 year Flood Innundation</b>	<b>Area (ft<sup>2</sup>)</b>	<b>P (ft)</b>	<b>n</b>	<b>s %</b>	<b>Qcapacity (cfs)</b>	<b>Vcapacity (fps)</b>
<b>Flooding Condition</b> <b>Q100=166 cfs</b>						
At Ult. R/W H=0.07' above CL	21.11	73.00	0.013	0.62	83.09	3.9
H=0.80' above CL	90.00	76.60	0.013	0.62	901.96	10.0
H=0.37' above CL	42.89	74.34	0.013	0.62	267.54	6.2
H=0.27' above CL	35.59	73.89	0.013	0.62	196.83	5.5
H=0.17' above CL	28.33	73.45	0.013	0.62	135.11	4.8
H=0.22' above CL	31.96	73.67	0.013	0.62	164.85	5.2
H=0.23' above CL	32.68	73.69	0.013	0.62	171.05	5.2

## ***APPENDIX***

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where:  $C_p$  = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.

**Table 3-1**  
**RUNOFF COEFFICIENTS FOR URBAN AREAS**

NRCS Elements	Land Use	County Elements	% IMPER.	Runoff Coefficient "C"		
				A	B	C
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

\*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the previous runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

# County of San Diego Hydrology Manual

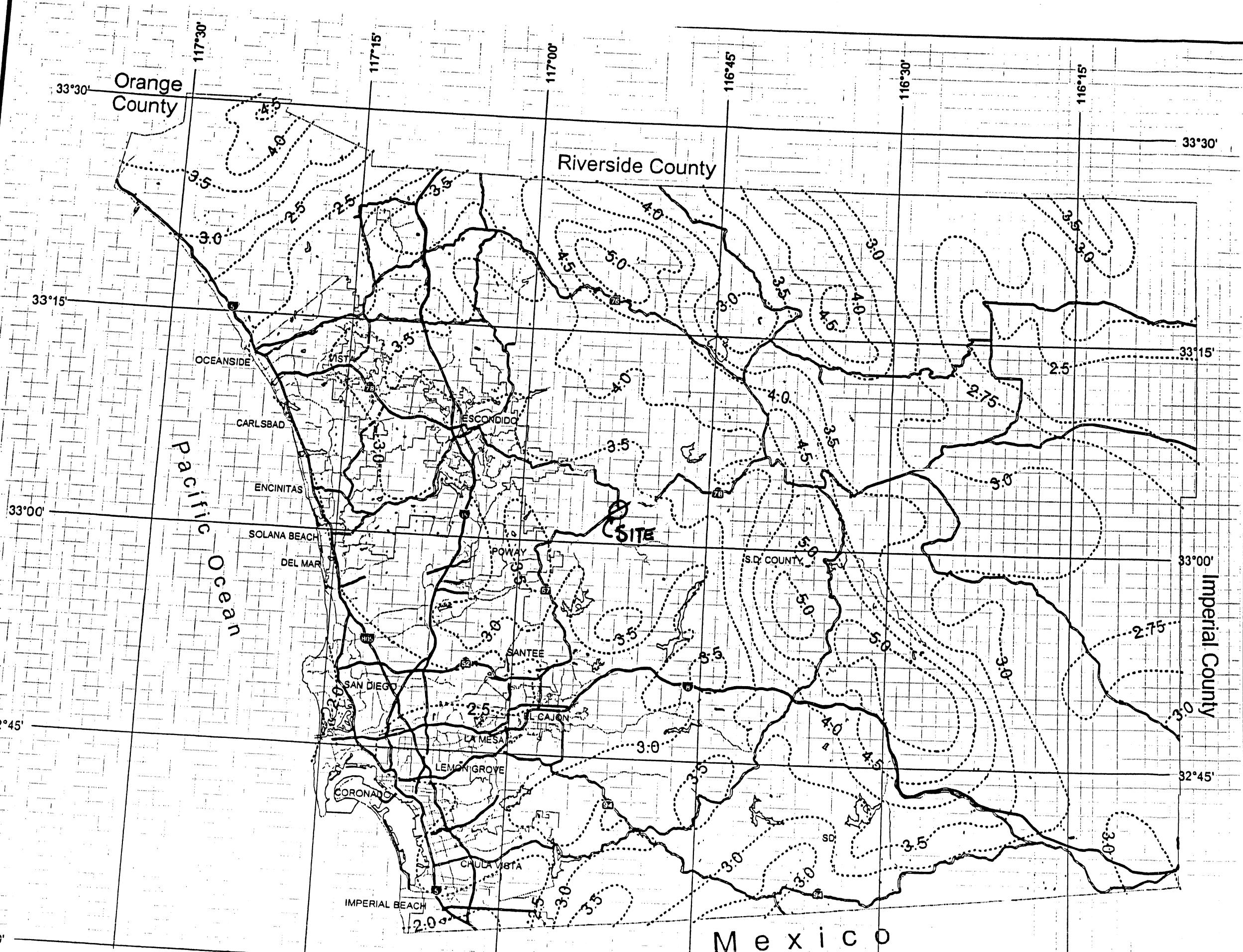


Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

..... Isopluvial (inches)

$$P_6 = 3.4$$



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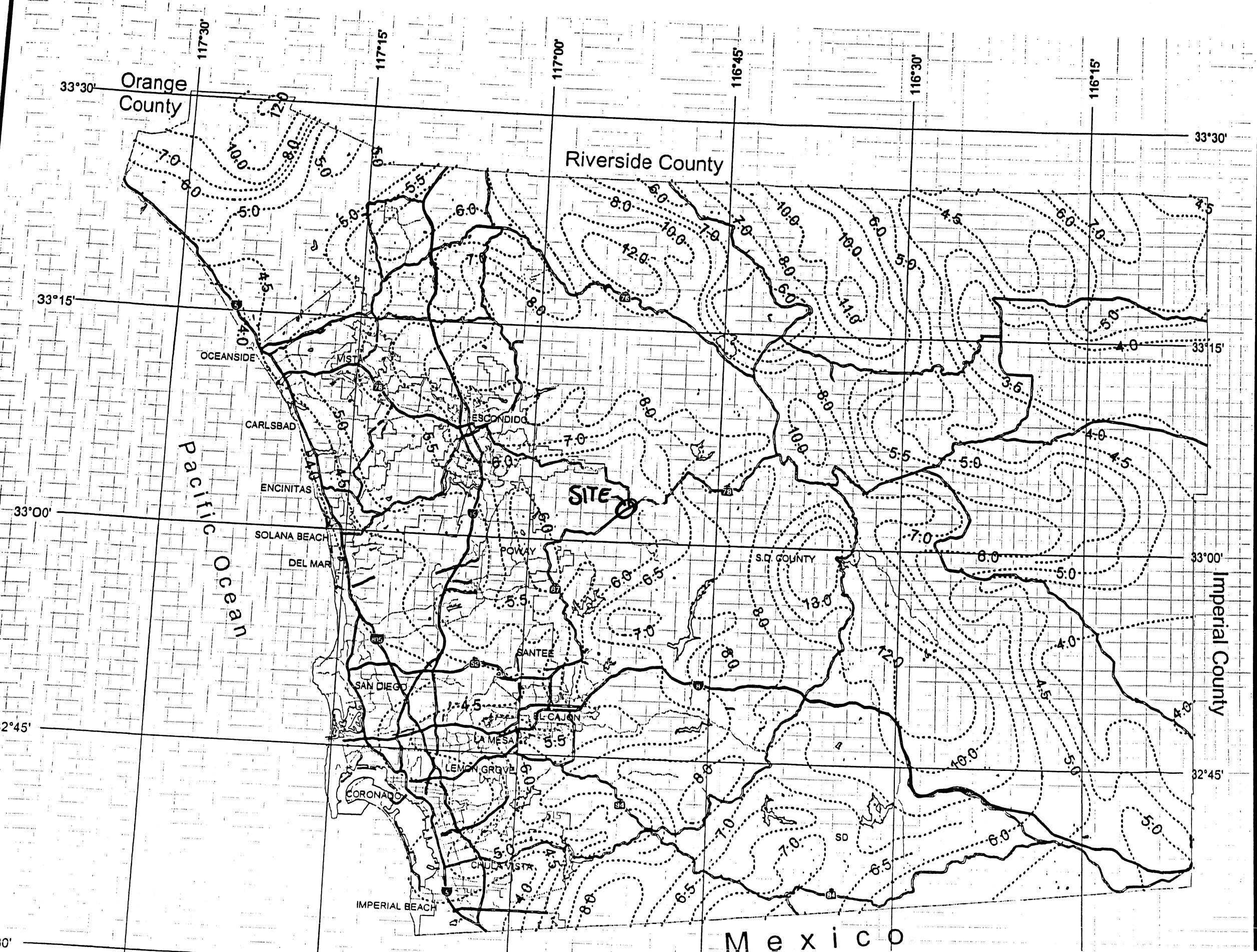


Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

$$P_{24} = 5.9$$



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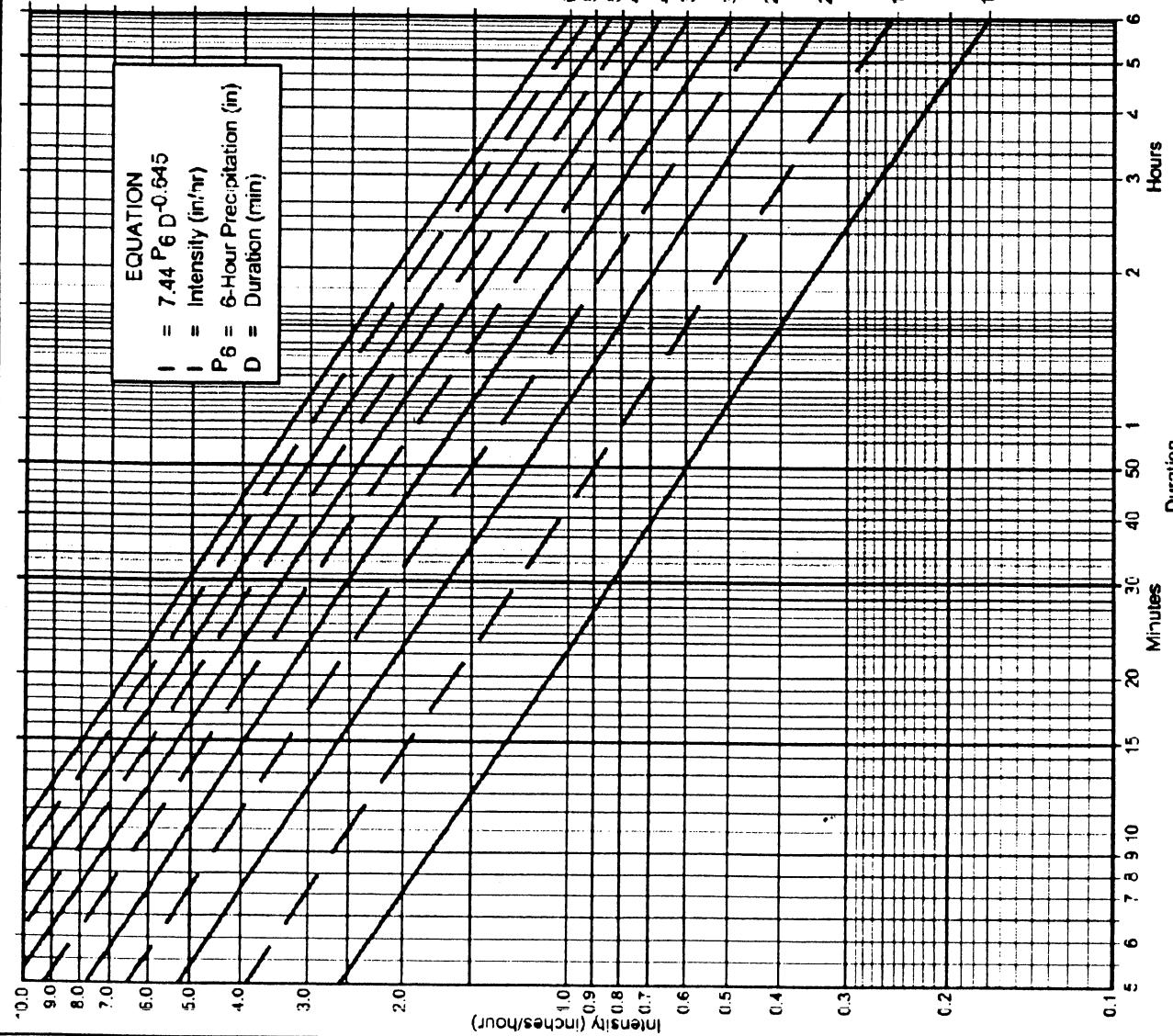
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# 3-1

FIGURE

Intensity-Duration Design Chart - Template



**Directions for Application:**

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point: parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

**Application Form:**

- (a) Selected frequency 100 year
- (b)  $P_6 = \underline{3.4}$  in..  $P_{24} = \underline{5.9}$   $\frac{P_6}{P_{24}} = \underline{.576}$   $\%^{(2)}$
- (c) Adjusted  $P_6^{(2)} = \underline{3.4}$  in.
- (d)  $I_x = \underline{\quad}$  min.
- (e)  $I = \underline{\quad}$  in./hr

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

$P_6$	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	1	1	1	1	1	1	1	1	1	1	1
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.95	13.17	14.49	15.81
6	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
7	1.66	2.53	3.37	4.21	5.05	5.90	6.74	7.53	8.42	9.27	10.11
8	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
9	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
10	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.29	4.87	5.13	5.60
11	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
12	0.69	.03	1.38	1.72	2.07	2.41	2.76	3.19	3.45	3.78	4.13
13	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.96	3.28	3.58
14	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
15	0.41	0.6	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.26	2.46
16	0.34	0.5	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
17	0.29	0.4	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
18	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.19	1.31	1.44	1.57
19	0.22	0.30	0.43	0.54	0.65	0.76	0.87	0.99	1.08	1.19	1.30
20	0.19	0.29	0.36	0.47	0.56	0.66	0.75	0.84	0.93	1.13	1.25
21	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.05

A - 4

# GRASS SWALE CHART

STEADY UNIFORM FLOW IN OPEN CHANNELS 7-43

Table 7-11. Values of  $K'$  in Formula  $Q = \frac{K'}{n} b^{5/8} s^{3/4}$  for

## Trapezoidal Channels

$D$  = depth of water       $b$  = bottom width of channel

$\frac{D}{b}$	Side slopes of channel, ratio of horizontal to vertical									
	Vertical	1/4-1	1/2-1	3/4-1	1-1	1 1/2-1	2-1	2 1/2-1	3-1	4-1
.01	.00068	.00068	.00069	.00069	.00069	.00069	.00069	.00069	.00070	.00070
.02	.00213	.00215	.00216	.00217	.00218	.00220	.00221	.00222	.00223	.00225
.03	.00414	.00419	.00423	.00426	.00428	.00433	.00436	.00439	.00443	.00449
.04	.00660	.00670	.00679	.00685	.00691	.00700	.00708	.00716	.00723	.00736
.05	.00946	.00964	.00979	.00991	.01002	.01019	.01033	.01047	.01060	.01086
.06	.0127	.0130	.0132	.0134	.0136	.0138	.0141	.0143	.0145	.0150
.07	.0162	.0166	.0170	.0173	.0175	.0180	.0183	.0187	.0190	.0197
.08	.0200	.0206	.0211	.0215	.0219	.0225	.0231	.0236	.0240	.0250
.09	.0241	.0249	.0256	.0262	.0267	.0275	.0282	.0289	.0296	.0310
.10	.0284	.0294	.0304	.0311	.0318	.0329	.0339	.0348	.0358	.0376
.11	.0329	.0343	.0354	.0364	.0373	.0387	.0400	.0413	.0424	.0448
.12	.0376	.0393	.0408	.0420	.0431	.0450	.0466	.0482	.0497	.0527
.13	.0425	.0446	.0464	.0480	.0493	.0516	.0537	.0556	.0575	.0613
.14	.0476	.0502	.0524	.0542	.0559	.0587	.0612	.0636	.0659	.0706
.15	.0528	.0559	.0585	.0608	.0627	.0662	.0692	.0721	.0749	.0805
.16	.0582	.0619	.0650	.0676	.0700	.0740	.0777	.0811	.0845	.0912
.17	.0638	.0680	.0716	.0748	.0775	.0823	.0866	.0907	.0947	.1026
.18	.0695	.0744	.0786	.0822	.0854	.0910	.0960	.1008	.1055	.1148
.19	.0753	.0809	.0857	.0899	.0936	.1001	.1059	.1115	.1169	.1277
.20	.0812	.0876	.0931	.0979	.1021	.1096	.1163	.1227	.1290	.1414
.21	.0873	.0945	.101	.106	.111	.120	.127	.135	.142	.156
.22	.0934	.1015	.109	.115	.120	.130	.139	.147	.155	.171
.23	.0997	.1087	.117	.124	.130	.141	.150	.160	.169	.187
.24	.1061	.1161	.125	.133	.140	.152	.163	.173	.184	.204
.25	.1125	.1236	.133	.142	.150	.163	.176	.188	.199	.222
.26	.119	.131	.142	.152	.160	.175	.189	.202	.215	.241
.27	.126	.139	.151	.162	.171	.188	.203	.218	.232	.260
.28	.132	.147	.160	.172	.182	.201	.217	.234	.249	.281
.29	.139	.155	.170	.182	.194	.214	.232	.250	.268	.302
.30	.146	.163	.179	.193	.205	.228	.248	.267	.287	.324
.31	.153	.172	.189	.204	.218	.242	.264	.285	.306	.347
.32	.160	.180	.199	.215	.230	.256	.281	.304	.327	.371
.33	.167	.189	.209	.227	.243	.271	.298	.323	.348	.396
.34	.174	.198	.219	.238	.256	.287	.316	.343	.370	.423
.35	.181	.207	.230	.251	.269	.303	.334	.363	.392	.450
.36	.189	.216	.241	.263	.283	.319	.353	.385	.416	.478
.37	.196	.225	.252	.275	.297	.336	.372	.406	.440	.507
.38	.203	.234	.263	.288	.312	.353	.392	.429	.465	.537
.39	.211	.244	.274	.301	.326	.371	.413	.452	.491	.568
.40	.218	.253	.286	.315	.341	.389	.434	.476	.518	.600
.41	.226	.263	.297	.328	.357	.408	.456	.501	.546	.633
.42	.233	.273	.309	.342	.373	.427	.478	.526	.574	.668
.43	.241	.283	.321	.357	.389	.447	.501	.553	.603	.703
.44	.248	.293	.334	.371	.405	.467	.525	.580	.633	.740
.45	.256	.303	.346	.386	.422	.488	.549	.607	.664	.777

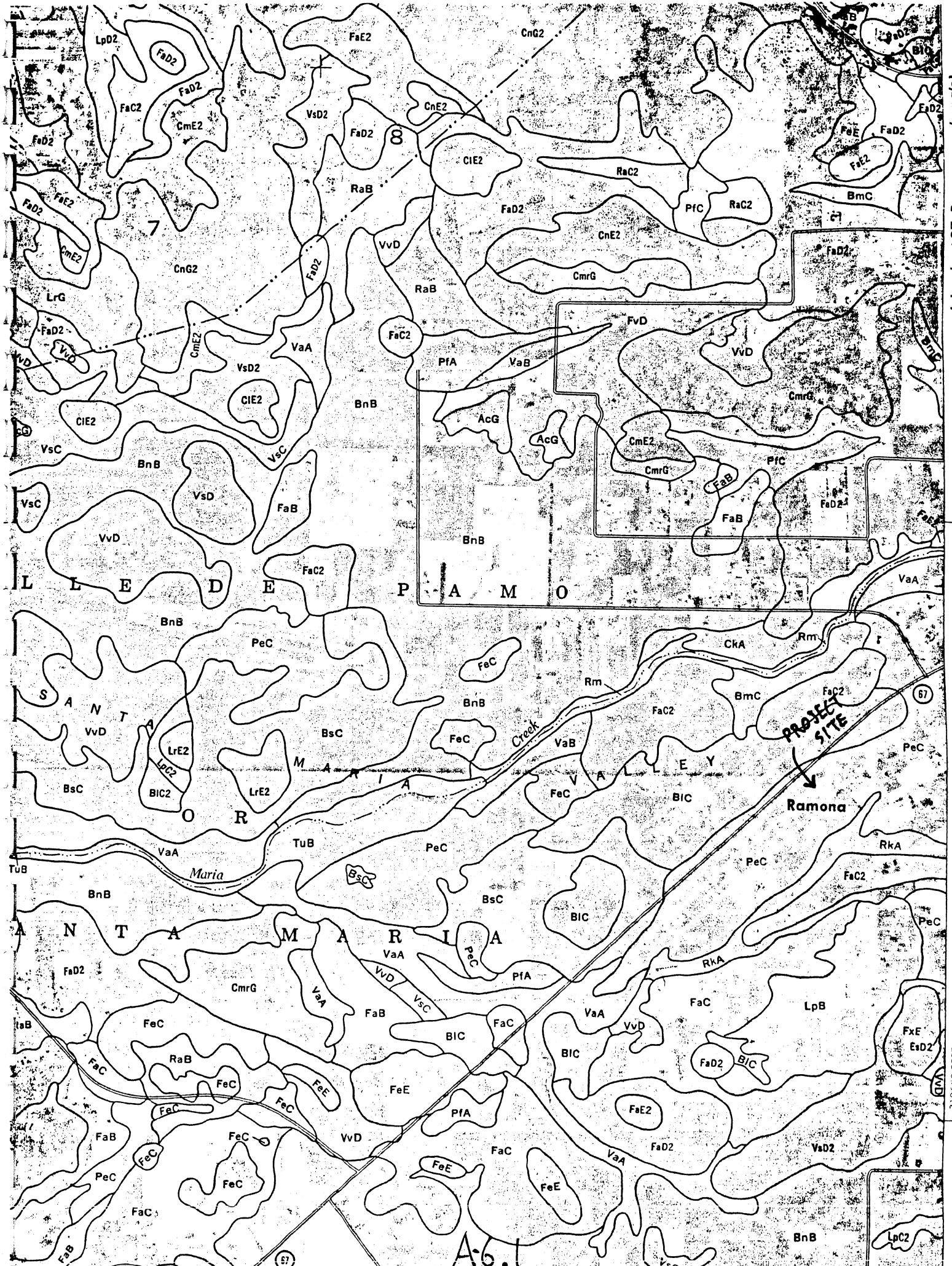
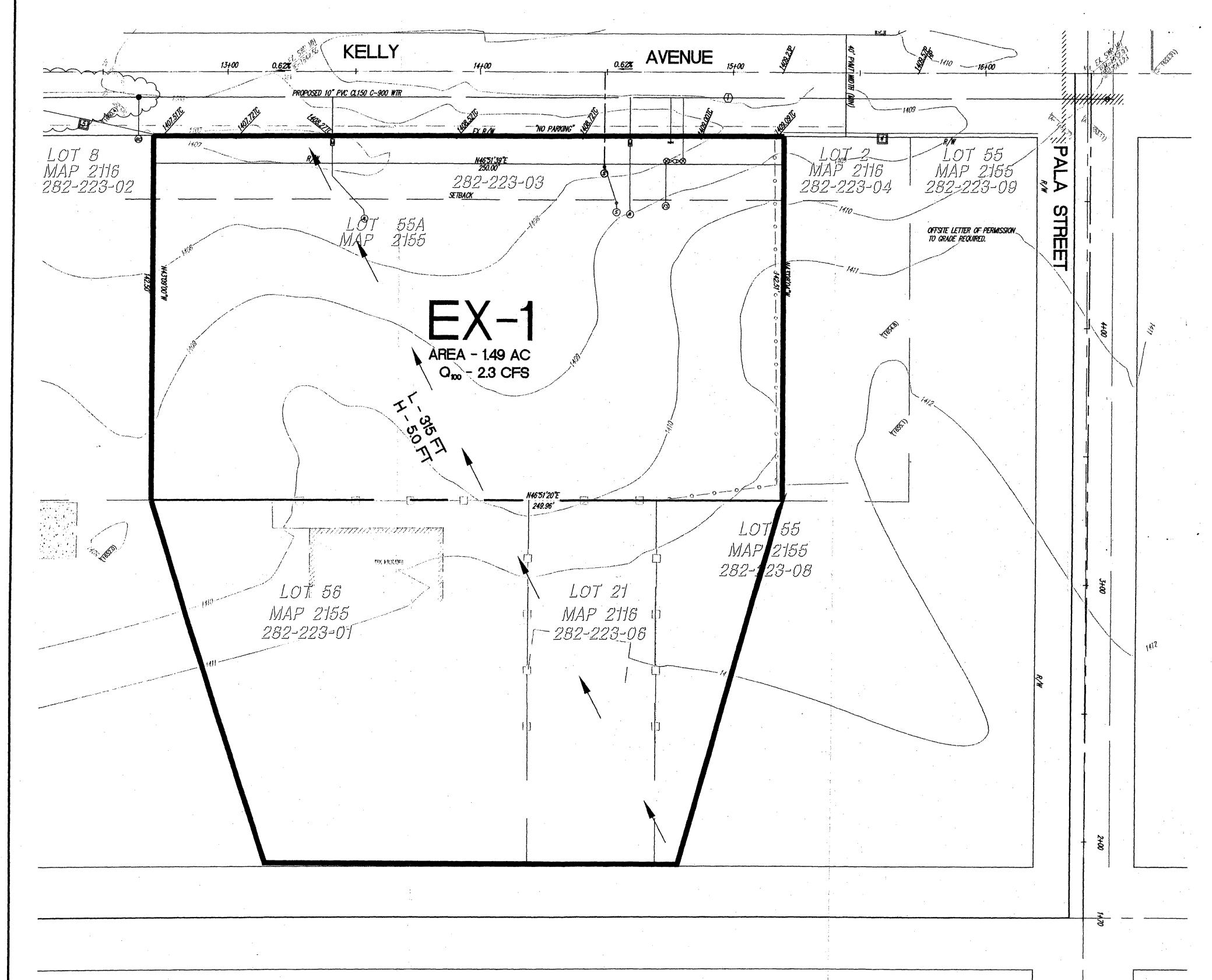


TABLE 11.--INTERPRETATIONS FOR LAND MANAGEMENT--Continued

Map symbol	Soil	Hydro-logic group	Erodibility	Limitations for conversion from brush to grass
LfE	Las Flores-Urban land complex, 9 to 30 percent slopes: Las Flores----- Urban land-----	D D		
LpB	Las Posas fine sandy loam, 2 to 5 percent slopes-----	D	Moderate 2---	Slight.
LpC	Las Posas fine sandy loam, 5 to 9 percent slopes-----	D	Moderate 2---	Slight.
LpC2	Las Posas fine sandy loam, 5 to 9 percent slopes, eroded.	D	Moderate 2---	Slight.
LpD2	Las Posas fine sandy loam, 9 to 15 percent slopes, eroded.	D	Moderate 2---	Slight.
LpE2	Las Posas fine sandy loam, 15 to 30 percent slopes, eroded.	D	Moderate 1---	Slight.
LrE	Las Posas stony fine sandy loam, 9 to 30 percent slopes.	D	Moderate 1---	Moderate.
LrE2	Las Posas stony fine sandy loam, 9 to 30 percent slopes, eroded.	D	Moderate 1---	Moderate.
LrG	Las Posas stony fine sandy loam, 30 to 65 percent slopes.	D	Severe 1----	Moderate.
LsE	Linne clay loam, 9 to 30 percent slopes-----	C	Moderate 2---	Moderate.
LsF	Linne clay loam, 30 to 50 percent slopes-----	C	Severe 1----	Moderate.
Lu	Loamy alluvial land-----	B	Severe 16----	Slight.
LvF3	Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded: Loamy alluvial land----- Huerhuero-----	D D	Severe 1---- Severe 1----	Severe. Severe.
Md	Made land-----	D		
M1C	Marina loamy coarse sand, 2 to 9 percent slopes-----	A	Severe 2---	Slight.
M1E	Marina loamy coarse sand, 9 to 30 percent slopes-----	A	Severe 2---	Slight.
MnA	Mecca coarse sandy loam, 0 to 2 percent slopes-----	B	Severe 16	
MnB	Mecca coarse sandy loam, 2 to 5 percent slopes-----	B	Severe 16	
MoA	Mecca sandy loam, saline, 0 to 2 percent slopes-----	B	Severe 16	
MpA2	Mecca fine sandy loam, 0 to 2 percent slopes, eroded-----	B	Severe 16	
MrG	Metamorphic rock land-----	D	Severe 1----	Severe.
MvA	Mottsville loamy coarse sand, 0 to 2 percent slopes-----	A	Severe 2----	Slight. 4/
MvC	Mottsville loamy coarse sand, 2 to 9 percent slopes-----	A	Severe 2----	Slight. 4/
MvD	Mottsville loamy coarse sand, 9 to 15 percent slopes-----	A	Severe 2----	Slight. 4/
MxA	Mottsville loamy coarse sand, wet, 0 to 2 percent slopes.	D	Severe 2----	Slight. 4/
OhC	Olivenhain cobbly loam, 2 to 9 percent slopes-----	D	Severe 16	Slight.
OhE	Olivenhain cobbly loam, 9 to 30 percent slopes-----	D	Severe 16	Slight.
OhF	Olivenhain cobbly loam, 30 to 50 percent slopes-----	D	Severe 1----	Moderate.
OkC	Olivenhain-Urban land complex, 2 to 9 percent slopes: Olivenhain----- Urban land-----	D D		
OkE	Olivenhain-Urban land complex, 9 to 30 percent slopes: Olivenhain----- Urban land-----	D D		
PeA	Placentia sandy loam, 0 to 2 percent slopes-----	D	Severe 9----	Slight.
PeC	Placentia sandy loam, 2 to 9 percent slopes-----	D	Severe 9----	Slight.
PeC2	Placentia sandy loam, 5 to 9 percent slopes, eroded-----	D	Severe 9----	Slight.
PeD2	Placentia sandy loam, 9 to 15 percent slopes, eroded-----	D	Severe 9----	Slight.
PfA	Placentia sandy loam, thick surface, 0 to 2 percent slopes.	D	Severe 16	Slight.
PfC	Placentia sandy loam, thick surface, 2 to 9 percent slopes.	D	Severe 16----	Slight.
Py	Playas-----	D	Moderate 2	

See footnotes at end of table.



LEGEND:

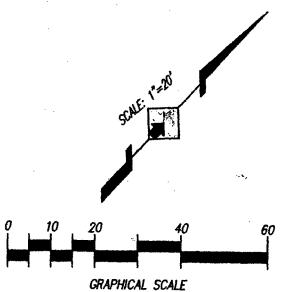
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*BASIN NO.*

## *BASIN LIMIT*

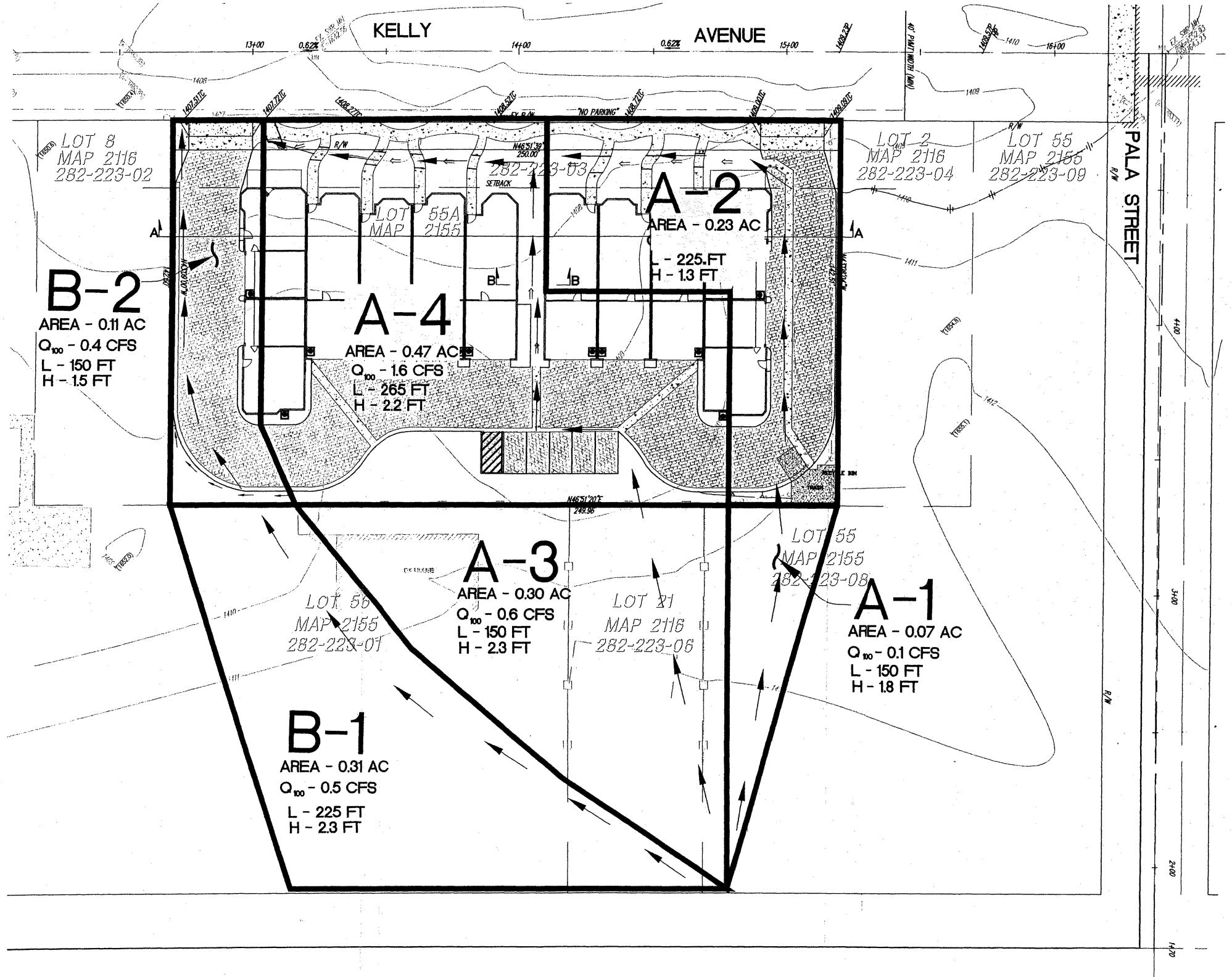
*DIRECTION OF FLOW* —

**EX-1**



**EXISTING  
HYDROLOGY EXHIBIT  
KELLY AVENUE**





LEGEND:

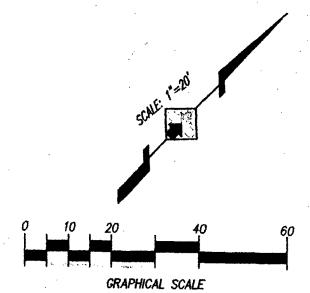
*PROJECT BOUNDARY* \_\_\_\_\_

*BASIN NO.*

### *BASIN LIMIT*

*DIRECTION OF FLOW -*

A-1



**PROPOSED  
HYDROLOGY EXHIBIT  
KELLY AVENUE**



## COUNTY OF SAN DIEGO

## TOPOGRAPHIC SURVEY

## EXISTING HYDROLOGY

## -LEGEND-

- [Symbol] Horizontal Control Monument Third Order
- [Symbol] Vertical Control Monument Second Order or Better
- [Symbol] Horizontal Control Monument Second Order or Better Vertical Control Monument Third Order
- [Symbol] Horizontal Control Monument Second Order or Better
- [Symbol] Horizontal Control Monument & Bench Mark Second Order or Better
- [Symbol] Horizontal Control Monument Third Order
- [Symbol] Horizontal Control Monument & Bench Mark Third Order
- [Symbol] Bench Mark Second Order or Better
- [Symbol] Vertical Control Monument Third Order
- [Symbol] Found Section, Grant or Subdivision Corner
- [Symbol] Photograph, Nadir Point
- [Symbol] Geographic Tick

## BOUNDARIES IN ORDER OF PRECEDENCE

- .025" National
- Name .025" County
- Name .025" City (Use at Border with County)
- Name within Bdry. .015" Reservation
- Name within Bdry. .015" National, State or County Park
- Name within Bdry. .015" Land Grant
- T25 .015" Township, Range, Section or Subdivision  
T35 .015" (Name of Subdivision within Bdry.)

PREPARED UNDER THE DIRECTION OF  
THE COUNTY ENGINEER OF THE  
COUNTY OF SAN DIEGO, CALIFORNIA

MAP CONTROL DATA FURNISHED BY  
THE COUNTY OF SAN DIEGO.

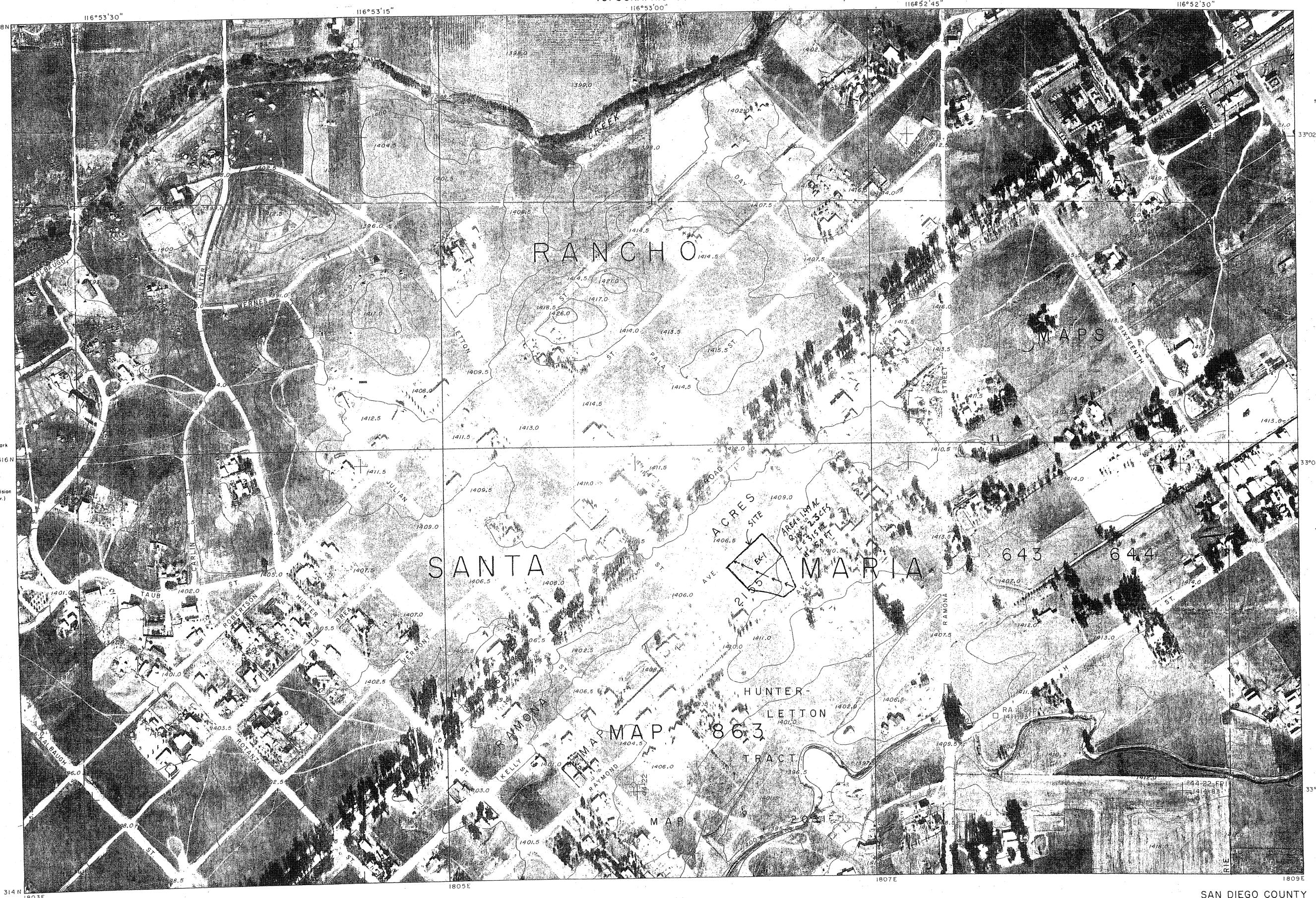
HORIZONTAL CONTROL IS BASED ON  
NORTH AMERICAN 1927 DATUM.

LAND LINES SHOWN ARE APPROXIMATE.

TOPOGRAPHY COMPILED BY PHOTOGRAMMETRIC METHODS FROM  
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ORTHOGRAPHIC IMAGE PREPARED FROM  
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SCALE 1:2400

CONTOUR INTERVAL 5 FEET

U.S.C.B.G.S. SEA LEVEL DATUM OF 1929

TWO THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)

THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS

THE GEOGRAPHIC VALUES ARE SHOWN ON THE NORTH AND EAST MARGINS

## INDEX TO ADJOINING SHEETS

318-1797	318-1803	318-1809
314-1797	314-1803	314-1809
310-1797	310-1803	310-1809

SAN DIEGO COUNTY  
CALIFORNIA

EDITION OF 1975

SHEET 314-1803

## TOPOGRAPHIC SURVEY

PROPOSED HYDROLOGY

## LEGEND -

- [Symbol] Horizontal Control Monument  
Third Order
- [Symbol] Vertical Control Monument  
Second Order or Better
- [Symbol] Horizontal Control Monument  
Second Order or Better
- [Symbol] Vertical Control Monument  
Third Order
- [Symbol] Horizontal Control Monument  
Second Order or Better
- [Symbol] Horizontal Control Monument & Bench Mark  
Second Order or Better
- [Symbol] Horizontal Control Monument  
Third Order
- [Symbol] Horizontal Control Monument & Bench Mark  
Third Order
- [Symbol] Bench Mark  
Second Order or Better
- [Symbol] Vertical Control Monument  
Third Order
- [Symbol] Found Section, Grant or Subdivision Corner
- [Symbol] Photograph, Nadir Point
- [Symbol] Geographic Tick

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- T25 .015" Township, Range, Section or Subdivision  
(Name of Subdivision within Bdry)

PREPARED UNDER THE DIRECTION OF  
THE COUNTY ENGINEER OF THE  
COUNTY OF SAN DIEGO, CALIFORNIA

MAP CONTROL DATA FURNISHED BY  
THE COUNTY OF SAN DIEGO

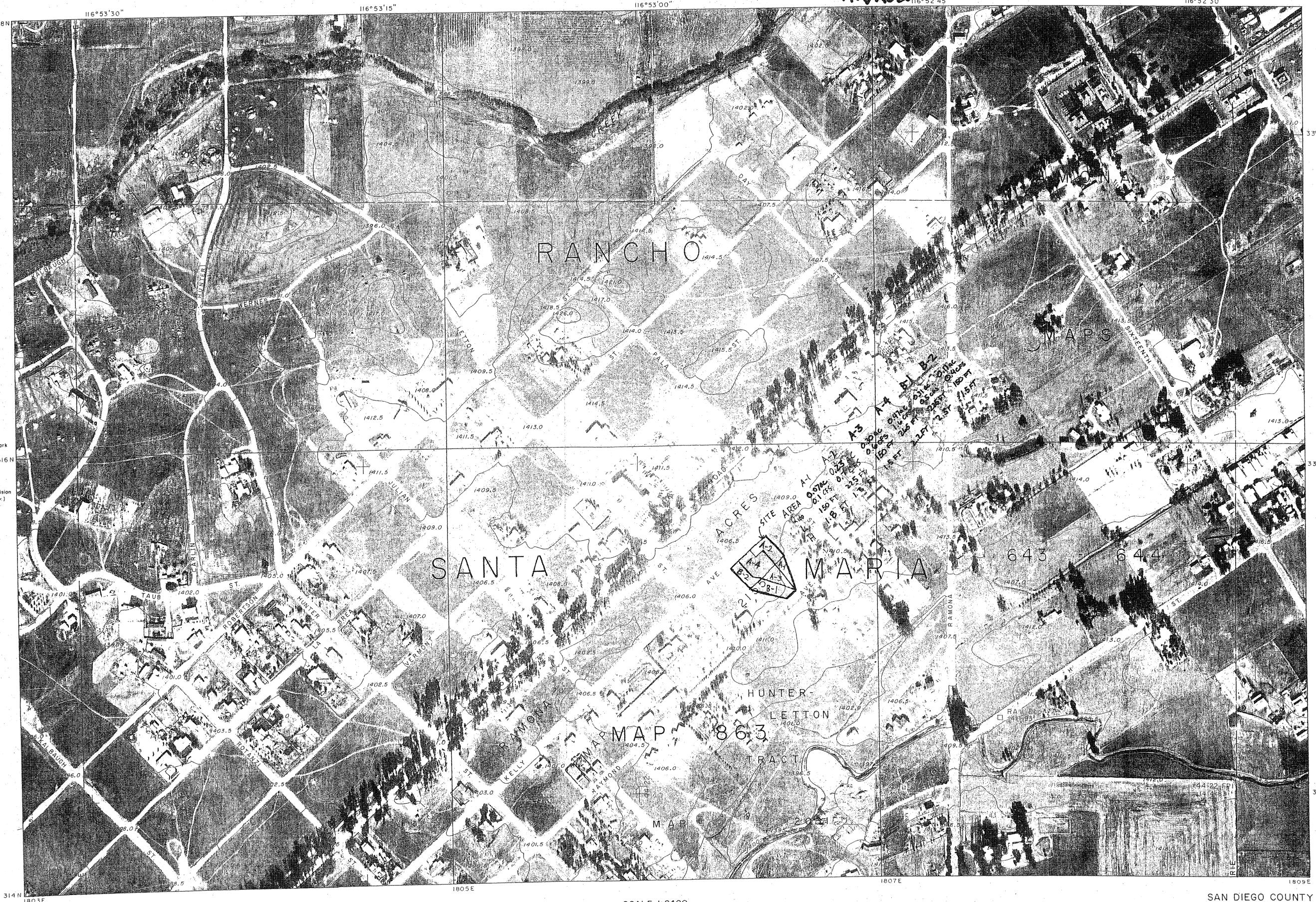
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SCALE 1:2400

200 0 200 400 600 800 1000  
CONTOUR INTERVAL 5 FEET  
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SAN DIEGO COUNTY  
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SHEET 314-1803